

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE  
NUMBER:M5-6SS-0112 -X**

**SUBSYSTEM NAME: ISS DOCKING SYSTEM**

**REVISION: 0 02/27/98**

---

**PART DATA**

---

	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	:PANEL A8A3	V828-730150
SRU	:TOGGLE SWITCH	MC452-0102-7801

---

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

SWITCH, TOGGLE, 3 POLE/2 POSITION, MAINTAINED ON - PYRO POWER MAIN A AND MAIN C CONTROL CIRCUIT

**REFERENCE DESIGNATORS:** 36V73A7A3S3  
36V73A7A3S4

**QUANTITY OF LIKE ITEMS:** 2  
TWO

**FUNCTION:**

PROVIDE MANUAL ACTIVATION OF THE PYROTECHNIC LOGIC AND FIRE CIRCUITS ROUTED TO THE PFCU.

**REFERENCE DOCUMENTS:** 1) VS70-953103, INTEGRATED SCHEMATIC - 53PA, PFCU POWER DISTRIBUTION CONTROL CIRCUIT

**FAILURE MODES EFFECTS ANALYSIS FMEA -- NON-CIL FAILURE MODE  
NUMBER: M5-6SS-0112-02**

**REVISION#: 0 02/27/98**

**SUBSYSTEM NAME: ISS DOCKING SYSTEM  
LRU: PANEL A6A3  
ITEM NAME: TOGGLE SWITCH**

**CRITICALITY OF THIS  
FAILURE MODE: 1R3**

**FAILURE MODE:  
FAILS CLOSED IN "ON" POSITION, CONTACT-TO-CONTACT SHORT**

**MISSION PHASE: OO ON-ORBIT**

**VEHICLE/PAYLOAD/KIT EFFECTIVITY:**

103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

**CAUSE:**

A) PIECE PART STRUCTURAL FAILURE, B) CONTAMINATION, C) VIBRATION, D) MECHANICAL SHOCK, E) PROCESSING ANOMALY, F) THERMAL STRESS

**CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO**

**CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? NO**

**REDUNDANCY SCREEN**

A) PASS
B) N/A
C) PASS

**PASS/FAIL RATIONALE:**

A)

B)

N/A - PYROTECHNIC SEPARATION IS CLASSIFIED AS STANDBY REDUNDANCY

C)

**METHOD OF FAULT DETECTION:**

TELEMETRY CAN BE USED TO VERIFY POWER ON OR OFF FOR THE PSU 20 AMP BUSES. "PYROTECHNIC BUS STATUS (AP, BP, AND CP)" AND "PYRO CIRCUIT PROTECT CIRCUIT OFF" INDICATIONS IN THE APDS D&C PANEL.

**MASTER MEAS. LIST NUMBERS: V53X0765E**

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M5-6SS-0112-02**

V53X0766E  
V53X0797E  
V53X0798E  
V53X0796E

**CORRECTING ACTION: NONE**

**CORRECTING ACTION DESCRIPTION:**

DESIGN FAULT TOLERANCE: PFCU KQ1 OR KQ2 RELAYS PROVIDE REDUNDANCY AGAINST INADVERTENT PYROTECHNIC SEPARATION.

**REMARKS/RECOMMENDATIONS:**

V53X0765E PYRO CKT PROTECT OFF CHANNEL 1  
V53X0766E PYRO CKT PROTECT OFF CHANNEL 2  
V53X0797E PYRO LOGIC POWER BUS A  
V53X0798E PYRO LOGIC POWER BUS B  
V53X0796E PYRO LOGIC POWER BUS C

---

**- FAILURE EFFECTS -**

---

**(A) SUBSYSTEM:**

DEGRADATION OF REDUNDANCY AGAINST INADVERTENT PYROTECHNIC SEPARATION.

**(B) INTERFACING SUBSYSTEM(S):**

UNWANTED COMMAND - ONE OF TWO PFCU LOGIC AND POWER CIRCUITS ALWAYS ENERGIZED.

**(C) MISSION:**

FIRST FAILURE - NO EFFECT

**(D) CREW, VEHICLE, AND ELEMENT(S):**

FIRST FAILURE - NO EFFECT

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

POSSIBLE LOSS OF CREW/VEHICLE AFTER FOUR FAILURES:

- 1) PYRO POWER SWITCH FAILS CLOSED.
- 2) PFCU KQ1 OR KQ2 RELAYS FAIL CLOSED - DEGRADED REDUNDANCY AGAINST PYROTECHNIC SEPARATION.
- 3) PYRO LOGIC BUS "B" CIRCUIT BREAKER FAILS CLOSED (DETECTABLE) - DEGRADED REDUNDANCY AGAINST PYROTECHNIC SEPARATION.
- 4) HOOKS PYRO FIRE SWITCH MULTIPLE CONTACT FAILURE. POSSIBLE VEHICLE SEPARATION OR LOSS OF HABITABLE VOLUME DUE TO UNWANTED PYRO "FIRE" COMMAND.

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M5-6SS-0112-02

---

- TIME FRAME -

---

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: MINUTES

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: N/A

IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?  
N/A

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:**

DESIGN FAULT TOLERANCE: PFCU KQ1 OR KQ2 RELAYS CONTROLLED BY THE PYRO POWER SWITCH PROVIDE REDUNDANCY AGAINST INADVERTENT PYROTECHNIC SEPARATION. IF EITHER OF THESE RELAYS FAIL CLOSED, THE CREW CAN OPEN THE ASSOCIATED PYRO LOGIC BUS CIRCUIT BREAKER TO PREVENT AN UNCOMMANDED PYRO "FIRE" COMMAND.

HAZARD REPORT NUMBER(S): ORBI 511

**HAZARD(S) DESCRIPTION:**

LOSS OF HABITABLE ENVIRONMENT IN ODS/CREW MODULE.

---

- APPROVALS -

---

SS&PAE  
DESIGN ENGINEERING

T. K. KIMURA  
C. J. ARROYO

*J. Kimura 4-13-98*  
*C. J. Arroyo*